

CLAIMS

It is claimed:

1. A light emitting device comprising:  
5 a light emitting diode;  
a submount;  
a phosphor material disposed around at least a portion of said light  
emitting diode; and  
an underfill between a first surface of the light emitting diode and a  
10 first surface of the submount, wherein the underfill has characteristics to reduce  
contamination of the light emitting diode by the phosphor material.
2. The light emitting device of claim 1, wherein the light emitting diode  
has a reflective layer.  
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3. The light emitting device of claim 2, wherein the reflective layer  
comprises silver.
4. The light emitting device of claim 1, wherein the submount comprises  
20 a silicon substrate.
5. The light emitting device of claim 1, wherein the phosphor material  
comprises a material selected from a group consisting of strontium thiogallate,  
calcium thiogallate, strontium sulfide, and any combination thereof.  
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6. The light emitting device of claim 1, wherein the phosphor material comprises a sulfur compound.

7. The light emitting device of claim 1, wherein the phosphor material further comprises a gettering compound, the gettering compound comprising a gettering ion and a counter-ion, said gettering ion comprising a material selected from a group consisting of Group VA elements, Group VB elements, Group VIB elements, Group IVA elements, organic ligands, and any combination thereof.

8. The light emitting device of claim 1, wherein the underfill comprises a material selected from a group consisting of cyanate ester resin, epoxy resin, epoxy, urethane, acrylate, and any combination thereof.

9. The light emitting device of claim 1, wherein the underfill comprises a filler.

10. The light emitting device of claim 9, wherein the filler comprises a material selected from a group consisting of silicon dioxide, fumed silica, titanium dioxide, inorganic silicates, inorganic clays, inert metals, metal oxides, and any combination thereof.

11. The light emitting device of claim 9, wherein the filler is reflective.

12. The light emitting device of claim 1, wherein the underfill comprises a gettering compound, the gettering compound comprising a gettering ion and a

counter-ion, said gettering ion comprising a material selected from a group consisting of Group VA elements, Group VB elements, Group VIB elements, Group IVA elements, organic ligands, and any combination thereof.

5           13.     The light emitting device of claim 12, wherein the underfill further comprises fumed silica.

14.     The light emitting device of claim 12, wherein the gettering ion comprises a material selected from a group consisting of chromium, molybdenum, tungsten, vanadium, niobium, tantalum, bismuth, hafnium, lead, and any combination thereof.

15           15.     The light emitting device of claim 12, wherein the gettering ion and a sulfide ion form a compound with a solubility product less than about  $10^{-30}$ .

16.     A method of making a light emitting device, the method comprising:  
providing a light emitting diode;  
disposing a phosphor material around at least a portion of said light emitting diode; and

20           disposing an underfill between a first surface of the light emitting diode and a first surface of a submount, wherein the underfill has characteristics to reduce contamination of the light emitting diode by the phosphor material.

25           17.     The method of claim 16, wherein providing the light emitting diode comprises providing a light emitting diode having a silver reflective layer.

18. The method of claim 16, wherein disposing the phosphor material comprises disposing a material selected from a group consisting of strontium thiogallate, calcium thiogallate, strontium sulfide, and any combination thereof.

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19. The method of claim 16, wherein disposing the phosphor material comprises disposing a sulfur compound.

20. The method of claim 16, wherein disposing the underfill comprises disposing a material selected from a group consisting of cyanate ester resin, epoxy resin, epoxy, urethane, acrylate, and any combination thereof.

21. The method of claim 16, wherein disposing the underfill comprises disposing a gettering compound, wherein the gettering compound comprises a gettering ion and a counter-ion, said gettering ion comprising a material selected from a group consisting of Group VA elements, Group VB elements, Group VIB elements, Group IVA elements, organic ligands, and any combination thereof.